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DESCRIPTION

INFORMATION PROCESS APPARATUS AND METHOD, PROGRAM  
RECORD MEDIUM, AND PROGRAM

Technical Field

5 The present invention relates to an information process apparatus and method, a program record medium, and a program, in particular, to an information process apparatus and method, a program record medium, and a program that allow data to be  
10 smoothly reproduced.

Background Art

In recent years, with decreases of the prices of record mediums such as CD-RW (Compact Disc-ReWritable) and DVD-RW (Digital Versatile Disc-ReWritable) that allow data to be repeatedly written and erased, they have been widespread.  
15

On these disc-shaped record mediums, predetermined data can be randomly accessed. Video data and audio data can be written as contents on these record mediums and contents can be erased therefrom.  
20 Information of many contents written to record mediums is totally managed with a content management file or the like.

With a content management table, attribute information composed of for example pointers that represent the recorded positions of contents, recorded date and time, changed date and time, protect  
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information, thumbnails (images) of the contents, and text information such as title names of the contents are managed.

Thus, when a content is reproduced from a record medium, data of a content are accessed according to the position of the pointer to "content" of the content management table. Reproduction information (for example, the type of codec of data that composes the content, the resolution of data, and so forth) with which the content is reproduced from whole or a part of data is obtained from the data of the content.  
According to the obtained reproduction information, data are reproduced.

However, when reproduction information with which a content is reproduced is obtained from data, it takes a time to obtain the reproduction information for example it takes a time to interpret the data. Thus, data of a content to be reproduced may not be reproduced at the reproduction time.

When all contents recorded on the record medium are successively and smoothly reproduced, after data are reproduced from a particular position, it is necessary to obtain reproduction information from the next data recorded in an area apart from the particular position. In this case, when the reproduction target that the reproduction apparatus reproduces is moved from a particular area to the other area, a seek will

take place.

When the seek time necessary to perform the seek is long, since not only the seek time, but time for obtaining the reproduction time from the data is required, data of a content to be reproduced next cannot be read at the reproduction time. Thus, the reproduction will stops. In other words, it was difficult to continuously and smoothly reproduce data of a plurality of contents.

## 10 Disclosure of the Invention

The present invention is made from the foregoing of point of view and to smoothly reproduce data.

An information process apparatus according to the present invention comprises information obtainment means for obtaining reproduction information necessary to reproduce the data when the data are recorded; generation means for generating a first management file with which the data are managed for each piece thereof, the first management file describing the reproduction information obtained by the information obtainment means and an identifier that uniquely identifies the data; and registration means for registering management information of the data composed of the reproduction information obtained by the information obtainment means, the identifier of the data, and information that represents the recorded position of the data to a

second management file with which the data recorded on the record medium are totally managed.

The registration means adds the management information of the data to the last end of the second management file.

5 The information process apparatus further comprises reproduction means for reproducing the data according to the first management file or the second management file.

10 The information process apparatus further comprises successive reproduction means for successively reproducing all the data recorded on the record medium according to the first management file or the second management file.

15 An information process method according to the present invention comprising the steps of obtaining reproduction information necessary to reproduce the data when the data are recorded; generating a first management file with which the data are managed for each piece thereof, the first management file describing the reproduction information obtained by a process of information obtainment step and an identifier that uniquely identifies the data; and registering management information of the data composed of the reproduction information obtained by the process of the information obtainment step, the identifier of the data, and information that represents the recorded

position of the data to a second management file with which the data recorded on the record medium are totally managed.

A program record medium on which a program is recorded according to the present invention, the program comprising the steps of obtaining reproduction information necessary to reproduce the data when the data are recorded; generating a first management file with which the data are managed for each piece thereof, 5 the first management file describing the reproduction information obtained by a process of information obtainment step and an identifier that uniquely identifies the data; and registering management information of the data composed of the reproduction information obtained by the process of the information obtainment step, the identifier of the data, and 10 information that represents the recorded position of the data to a second management file with which the data recorded on the record medium are totally managed.

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A program according to the present invention comprises the steps of obtaining reproduction information necessary to reproduce the data when the data are recorded; generating a first management file with which the data are managed for each piece thereof, 20 the first management file describing the reproduction information obtained by a process of information obtainment step and an identifier that uniquely 25

identifies the data; and registering management information of the data composed of the reproduction information obtained by the process of the information obtainment step, the identifier of the data, and 5 information that represents the recorded position of the data to a second management file with which the data recorded on the record medium are totally managed.

According to the present invention, reproduction information necessary to reproduce the 10 data is obtained when the data are recorded. A first management file with which the data are managed for each piece thereof is generated. The first management file describes the obtained reproduction information and an identifier that uniquely identifies the data. 15 Management information of the data composed of the obtained reproduction information, the identifier of the data, and information that represents the recorded position of the data is registered to a second management file with which the data recorded on the 20 record medium are totally managed.

#### Brief Description of Drawings

Fig. 1 is a schematic diagram showing an example of the structure of a video program creation support system according to the present invention; Fig. 25 2 is a block diagram showing an example of the structure of a photographing device shown in Fig. 1; Fig. 3 is a block diagram showing an example of the

structure of a record control section shown in Fig. 2; Fig. 4 is a block diagram showing an example of the structure of a reproduction control section shown in Fig. 2; Fig. 5 is a schematic diagram showing an 5 example of the structure of a file system of an optical disc shown in Fig. 1; Fig. 6 is a schematic diagram showing an example of the structure of a clip directory shown in Fig. 5; Fig. 7 is a schematic diagram showing an example of the structure of an edit list directory shown in Fig. 5; Fig. 8 is a schematic diagram showing 10 an example of the structure of an index file shown in Fig. 5; Fig. 9 is a schematic diagram showing an example of a clip table shown in line 5 of Fig. 8; Fig. 10 is a schematic diagram showing an example of a clip 15 element of clip ID ["C0001"] shown in line 2 to line 5 of Fig. 9; Fig. 11 is a schematic diagram showing an example of an edit list table shown in line 6 of Fig. 8; Fig. 12 is a schematic diagram showing an example of an edit list element of edit list ID ["E0001"] shown in 20 line 2 to line 5 of Fig. 11; Fig. 13 is a schematic diagram showing an example of a code of a clip information file shown in Fig. 6; Fig. 14 is a schematic diagram showing an example of a code of a clip information file shown in Fig. 6; Fig. 15 is a 25 flow chart describing a read process for an index file of the photographing device shown in Fig. 1; Fig. 16 is a flow chart describing a clip generation process of

the photographing device shown in Fig. 1; Fig. 17 is a flow chart describing an index file update process at step S29 shown in Fig. 16; Fig. 18 is a flow chart describing a clip reproduction process of the photographing device shown in Fig. 1; Fig. 19 is a flow chart describing another example of the clip reproduction process of the photographing device shown in Fig. 1; and Fig. 20 is a flow chart describing a tape reproduction process of the photographing device shown in Fig. 1.

#### Best Modes for Carrying out the Invention

Next, embodiments of the present invention will be described. The relationship between the structural elements described in the claims and the embodiments of the present patent application is as follows. This relationship represents that examples that support the claims of the present patent application are described in the embodiments of the present patent application. Thus, even if examples corresponding to the embodiments are not described in this section, the examples should not be construed as those that do not correspond to the structural elements of the claims of the present patent application. In contrast, even if examples are described in this section as those that correspond to the structural elements of the claims, the examples should not be construed as those that do not correspond to other than

the structural elements of the claims of the present patent application.

In addition, the description of this section does not mean that all aspects of the present invention that correspond to the examples described in the embodiments of the present patent application are not described in the claims of the present patent application. In other words, this description does not deny the possibility of which there are aspects of the present invention that are described in the embodiments but not described in the claims of the present patent application, namely aspects of the present invention that may be filed as divisional patent application(s) or aspects of the present invention that may be added as amendments.

An information process apparatus of claim 1 is an information process apparatus (for example, a photographing device 14 shown in Fig. 1) that manages data (for example, a clip) recorded on a record medium (for example, an optical disc 17 shown in Fig. 17), comprising information obtainment means (for example, an information obtainment section 102 shown in Fig. 3) for obtaining reproduction information (for example, resolution of data and type of codec) necessary to reproduce the data when the data are recorded; generation means (for example, a clip generation section 104 shown in Fig. 3) for generating a first

management file (for example, a clip information file  
151 shown in Fig. 6) with which the data are managed  
for each piece thereof (for example, a clip), the first  
management file describing the reproduction information  
5 (for example, [type = "IMX50"], line 8, Fig. 13)  
obtained by the information obtainment means and an  
identifier (for example, [umid: 060A2B340101010501010D  
1213000000123456789ABCDEF0123456789ABCDEF]), line 7  
and line 8, Fig. 13) that uniquely identifies the data;  
10 and registration means (for example, an index file  
update section 105 shown in Fig. 3) for registering  
management information (for example, a clip element) of  
the data composed of the reproduction information (for  
example, [type = "DV25\_411P"], line 4, Fig. 10)  
15 obtained by the information obtainment means, the  
identifier (for example, [umid = "0123456789ABCDEF  
0123456789ABCDEF0123456789A1"], line 3, Fig. 10) of the  
data, and information (for example, [file =  
"C0001V01.MXF"], line 4, Fig. 10) that represents the  
20 recorded position of the data to a second management  
file (for example, an index file 134 shown in Fig. 5)  
with which the data recorded on the record medium are  
totally managed.

An information process apparatus of claim 3  
25 further comprises reproduction means (for example, a  
clip reproduction section 111 shown in Fig. 4) for  
reproducing the data according to the first management

file (for example, a clip information file 151 shown in Fig. 6) or the second management file (for example, an index file 134 shown in Fig. 5).

An information process apparatus of claim 4  
5 further comprises successive reproduction means (for example, a tape reproduction section 112 shown in Fig. 4) for successively reproducing all the data recorded on the record medium (for example, an optical disc 17 shown in Fig. 4) according to the first management file  
10 (for example, a clip information file 151 shown in Fig. 6) or the second management file (for example, an index file 134 shown in Fig. 5).

An information process method of the present invention is an information process method of managing data (for example, a clip) recorded on a record medium  
15 (for example, an optical disc 17 shown in Fig. 1), comprising the steps of obtaining reproduction information (for example, resolution of data and type of codec) necessary to reproduce the data when the data  
20 are recorded (for example, at step S22 of Fig. 16); generating a first management file (for example, a clip information file 151 shown in Fig. 6) with which the data are managed for each piece thereof (for example, a clip), the first management file describing the  
25 reproduction information (for example, [type = "IMX50"], line 8, Fig. 13) obtained by a process of information obtainment step and an identifier (for example, [umid:

060A2B340101010501010D1213000000123456789ABCDEF  
0123456789ABCDEF]), line 7 and line 8, Fig. 13) that  
uniquely identifies the data (for example, at step S28  
of Fig. 16); and registering management information  
5 (for example, a clip element) of the data composed of  
the reproduction information (for example, [type =  
"DV25\_411P", line 4, Fig. 10) obtained by the process  
of the information obtainment step, the identifier (for  
example, [umid = "0123456789ABCDEF0123456789ABCDEF  
10 0123456789A1"], line 3, Fig. 10) of the data, and  
information (for example, [file = "C0001V01.MXF"], line  
4, Fig. 10) that represents the recorded position of  
the data to a second management file (for example, an  
index file 134 shown in Fig. 5) with which the data  
15 recorded on the record medium are totally managed (for  
example, at step S29 of Fig. 16).

A program record medium and a program of the  
present invention basically have the same structure as  
the information process method of the present invention.  
20 Thus, their description will be omitted to prevent  
redundancy.

Next, with reference to the accompanying  
drawings, an embodiment of the present invention will  
be described.

25 Fig. 1 is a schematic diagram showing an  
example of the structure of a video program creation  
support system according to the present invention.

In Fig. 1, a video program creation support system 1 is a system installed in for example a television broadcast station that broadcasts a television signal and a video content creation company that creates video contents of videos and movies. In 5 addition, the video program creation support system 1 is a system with which video programs as video works such as television programs and movies are created. The video program creation support system 1 is a system 10 that allows video programs to be effectively created so that meta data and so forth added to video programs as electronic files can be consistently used among a plurality of departments that share the creation of a video program.

15 As shown in Fig. 1, the video program creation support system 1 is composed of a planning terminal device 11 with which a video program is planned, a network 12 to which the planning terminal device 11 is connected, a news collection terminal device 13 connected to the network 12, a photographing device 14 that composes the news collection terminal device 13, a field PC/PDA (Personal Computer/Personal 20 Digital Assistants) 15 (hereinafter referred to as the field PC/PDA 15), an editing terminal device 16 connected to the network 12, and an optical disc 17 25 that is a record medium.

The planning terminal device 11 is composed

of an information process device such as a personal compute, its peripheral devices, and so forth. The planning terminal device 11 is installed in a planning and organizing department that plans video programs.

5       The planning and organizing department manages the overall creation of a video program, makes a plan thereof, creates a scenario (story) thereof, and assigns creation works to other departments such as a news collection department and an editing department

10      that will be described later. The planning terminal device 11 performs a process that creates construction table meta data that contains creation command information and so forth according to a scenario of each video program in an electronic file format. The

15      planning terminal device 11 supplies the created construction table meta data to the news collection terminal device 13 and so forth through the network 12. In this manner, the planning and organizing department gives commands for news collection and photographic scenes to the news collection department and so forth.

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The news collection terminal device 13 is a group of terminal devices used in the news collection department that collects news. The news collection terminal device 13 is composed of for example the photographing device 14 and the field PC 15. The news collection department collects news according to the creation commands received from the planning and

organizing department and a scenario on the creation spot. The news collection department photographs pictures of individual scenes that compose a video program and collects photographing conditions.

5                 The photographing device 14 is a video camera such as Camcorder (registered trademark). The photographing device 14 is a device that is used to collect news for a news program and photograph scenes of matches of sports and video contents such as movies.

10                 The photographing device 14 is connected to the network

12. The photographing device 14 obtains construction table meta data from the planning terminal device 11 through the network 12. The photographing device 14 displays the obtained construction table meta data in a predetermined display section or the like so that a photographing staff member such as a camera man can recognize scenes that he or she needs to take pictures of. In addition, the photographing staff member operates the photographing device 14 to take pictures

15.                 of individual scenes that compose a video program according to creation command information of the obtained construction table meta data.

20                 The photographing device 14 records video data and audio data that have been obtained by the photography to a record medium such as the optical disc

25                 17. At this point, the photographing device 14 handles data of a video content that contains video data, audio

data, and so forth as one clip that is a unit that represents one photographing process and records clips to the optical disc 17 so as to manage the clips.

In addition, the photographing device 14  
5 records not only original video data as video data that have been photographed, but low resolution video data (hereinafter referred to as the low resolution data) as clips to the optical disc 17 so as to manage them. Although the data amount of original video data is  
10 large, since the resolution thereof is high, they are used as a final video program. In contrast, the low resolution data are video data generated by decreasing the number of pixels of each frame of original video data. Thus, the low resolution data are video data of  
15 pictures of frames whose number of pixels is small. Although the picture quality of the low resolution data is lower than that of the original video data, since the data amount of the low resolution picture is small, the loads of a transmission process, a reproduction process, and so forth are light. Thus, the low  
20 resolution data are mainly used for a rough edit process and so forth.

A plurality of clips recorded on the optical disc 17 by the photographing device 14 are managed with  
25 an index file that totally manages them (the index file will be described later with reference to Fig. 5) and a clip information file that manages video data, audio

data, and so forth that compose a clip (the clip information file will be described later with reference to Fig. 6).

The photographing device 14 displays video data and so forth of a clip recorded on the optical disc 17 in a predetermined display section or the like according to the index file or the clip information file so that the photographing staff member can check whether he or she has took a picture according to the creation command information. In addition, the photographing device 14 is capable of successively displaying a plurality of clips recorded on the optical disc 17 in the predetermined display section or the like according to the index file or the clip information file as if video data recorded on a tape were successively reproduced so that the photographing staff member can successively check a plurality of scenes that he or she has taken.

A clip is a unit that represents not only one photographing process, but a duration from the beginning of the photographing process to the end thereof. Instead, a clip may be a unit that represents the length of one of various types of data obtained in the photographing process. Instead, a clip may be a unit that represents the data amount of one of various types of data obtained in the photographing process. Instead, a clip may represent a

set of various types of data.

The optical disc 17 on which a plurality of clips (video data, audio data, and so forth) have been recorded by the photographing device 14 is carried to for example the editing department, which will be described later, the field PC 15, or the like so that they are used thereby. However, since it takes a time to carry the optical disc 17 to them, the photographing device 14 may supply video data to the planning terminal device 11, the field PC 15, the editing terminal device 16, or the like through the network 12. In this case, it is preferred that the photographing device 14 supply the corresponding low resolution data of the video data that have been photographed because the data amount of the low resolution data is smaller than that of the video data that have been photographed, to shorten the transfer time (lighten the load of the transfer process).

The transfer process for the low resolution data by the photographing device 14 may be performed at any timing. In other words, the transfer process may be performed in parallel with the photographing process. Instead, the transfer process may be performed after the photographing process has been completed.

When the low resolution data are transferred, the editing department can start the editing work in a relatively early stage before the editing department

receives the optical disc 17 (for example, while the photographing process is being performed). Thus, the creation efficiency of the video program can be improved. When the low resolution data are transferred through the network 12, the photographing device 14 may record only original video data and audio data (without the low resolution data thereof) to the optical disc 17.

The record medium on which the photographing device 14 records video contents and so forth are not limited to the foregoing optical disc 17. Instead, any type of a record medium may be used. For example, a optical-magnetic disc including MD (Mini-Disc) (registered trademark) or MO (Magneto Optical disc), a magnetic disc that includes a flexible disc, a magnetic tape used for DV (Digital Video) and VHD (Video Home System), a semiconductor memory that includes a flash memory, or the like may be used.

The field PC 15 is composed of for example a portable information process device such as a note type personal computer, a PDA, or the like, its peripheral devices, and so forth. The field PC 15 is connected to the photographing device 14 through one of various types of non-wireless and wireless systems. The field PC 15 can share for example construction table meta data, video contents, and so forth with the photographing device 14.

The field PC 15 obtains construction table

meta data from the planning terminal device 11 through  
the network 12 and obtains construction table meta data  
from the photographing device 14. The field PC 15  
displays the obtained construction table meta data in  
5 the predetermined display section so that a person in  
charge of the news collection department can recognize  
scenes that he or she needs to collect and photograph.

In addition, the field PC 15 generates  
photography state information that is information about  
10 news collection and photography states corresponding to  
an input of a person in charge of the news collection  
department as a user and adds the generated photography  
state information to a related field of the  
construction table meta data. The photography state  
15 information is text data or the like described from  
various aspects for each take and for each news  
collection scene. The photography state information is  
information that will becomes useful when the later  
editing process is preformed. In such a manner, the  
20 field PC 15 edits construction table meta data by  
writing photography state information to the  
construction table meta data. In addition, the field  
PC 15 supplies photography state information as meta  
data to the photographing device 14 so that the  
photography state information is added to video data  
25 and audio data obtained by the photographing device 14.

The editing terminal device 16 is composed of

an information process device such as a personal computer and its peripheral devices. The editing terminal device 16 is installed in the editing department that performs the edit process for video contents. The editing department edits video data and audio data obtained by the photographing device 14 according to creation commands and scenario prepared by the planning and organizing department, construction table meta data reflected by news collection state of the news collection department and completes a video program.

The editing terminal device 16 obtains construction table meta data and low resolution data from for example the photographing device 14 through the network 12. In addition, the editing terminal device 16 obtains original video data and audio data from the optical disc 17 on which clips (video data and audio data) have been recorded. In addition, the editing terminal device 16 can directly obtain a creation command (a command regarding editing) from the planning terminal device 11, the field PC 15, or the like through the network 12.

The editing terminal device 16 suitably reproduces the obtained video content and displays it in the predetermined display section according to the obtained construction table meta data. For example, the user operates the editing terminal device 16 so

that it successively displays low resolution data obtained through the network 12 and original video data and audio data from the optical disc 17 according to the scenario, original video data and audio data of all 5 clips recorded on the optical disc 17, or only video data of a desired clip. When original video data recorded on the optical disc 17 are reproduced, the editing terminal device 16 uses a disc device that is a record and reproduction device that reads data from the 10 optical disc 17 and writes data thereto. At this point, the editing terminal device 16 references the index file or the clip information file, which manages data recorded on the optical disc 17.

The editing terminal device 16 reproduces required video data and so forth in the proper order according to for example construction table meta data and displays the reproduced video data and so forth. In addition, the editing terminal device 16 performs an edit process for video data and so forth that have been obtained by news collection work. The edit process can 20 be categorized as a rough edit process and a main edit process.

The rough edit process is a simple edit process for video data and audio data. For example, 25 when the editing terminal device 16 obtains a plurality of clips in the rough edit process, the editing terminal device 16 selects a clip that will be used in

the main edit process, selects (logs) a necessary  
picture portion from data of the selected clip, sets up  
the edit start point (In point) and the edit end point  
(Out point) of the selected picture portion with for  
5 example a time code, and extracts (ingests) the  
corresponding portion from the data of the clip.

The main edit process is a process that  
connects video data that compose clips for which the  
rough edit process has been performed, adjusts the  
10 final picture quality for the connected video data, and  
creates perfect package data that are data that will be  
broadcast as a program.

Like the photographing device 14, the editing  
terminal device 16 can combine video data and audio  
15 data obtained for example through the network 12 or  
from another record medium into one clip and record the  
clip to the optical disc 17.

There may be plurality of planning terminal  
devices 11, photographing devices 14, field PCs 15,  
20 editing terminal devices 16, and so forth. For example,  
video data and so forth obtained by a plurality of  
photographing devices 14 may be obtained by one editing  
terminal device 16 through the optical disc 17 or the  
network 12. The photographing device 14 may perform  
25 the edit process for the obtained data. Data supplied  
from one photographing device 14 may be edited by a  
plurality of editing terminal devices 16.

Although the planning terminal device 11, the photographing device 14, the field PC 15, the editing terminal device 16, and so forth were described as independent devices, parts or all functions of these devices may be mutually integrated.

In addition, besides the planning terminal device 11, the photographing device 14, the field PC 15, and the editing terminal device 16, the video program creation support system 1 may have for example a center server (not shown) connected to the network 12 to configure a client/server system of which the planning terminal device 11, the photographing device 14, the field PC 15, the editing terminal device 16, and so forth are clients.

Fig. 2 shows an example of the detailed structure of the photographing device 14 shown in Fig.

1. In Fig. 2, a CPU (Central Processing Unit) 51 of the photographing device 14 executes various processes according to a program stored in a ROM (Read Only Memory) 52. When necessary, a RAM (Random Access Memory) 53 stores data, a program, and so forth that the CPU 51 needs to execute various processes.

A record control section 54 controls the recording of video data, audio data, low resolution data, and so forth supplied from an encoder/decoder section 56 or video data, audio data, low resolution data, and so forth stored in a storage section 64 to

the optical disc 17 through a drive 66 according to a file system of the optical disc 17. Details of the file system will be described later with reference to Fig. 5.

5 A reproduction control section 55 controls the drive 66 according to the file system of the optical disc 17, reads video data, audio data, low resolution data, or the like from the optical disc 17, and supplies the video data, audio data, low resolution data, or the like read from the optical disc 17 to the encoder/decoder section 56.

10

The encoder/decoder section 56 encodes video data and audio data that are input from an input section 62 according to a predetermined codec and supplies the encoded video data and audio data to the storage section 64 or the record control section 54.

15

When necessary, the encoder/decoder section 56 encodes the video data are input from the input section 62 according to for example the MPEG4 system, supplies the encoded video data as low resolution data to the storage section 64 or the record control section 54,

20

encodes the audio data that are input from the input section 62 according to for example the ITU-T G.711 A-Law system, and supplies the encoded audio data as low resolution data to the storage section 64 or the record control section 54.

25

In addition, the encoder/decoder section 56

outputs the video data, audio data, or low resolution data supplied from the reproduction control section 55 to a monitor, a speaker, or the like that composes an output section 63.

5                 The CPU 51, the ROM 52, the RAM 53, the record control section 54, the reproduction control section 55, and the encoder/decoder section 56 are mutually connected through a bus 57. Connected to the bus 57 is also an input/output interface 60.

10                 Connected to the input/output interface 60 is an operation section 61 composed of a keyboard and a mouse. The input/output interface 60 outputs a signal corresponding to an input of the operation section 61 to the CPU 51. Connected to the input/output interface 60 are also the input section 62 composed of a camera that photographs an object and inputs the photographed video data, a microphone that inputs audio data, and so forth, the output section 63 composed of a monitor composed of a CRT (Cathode Ray Tube), an LCD (Liquid Crystal Display), or the like, a speaker, and so forth, a storage section 64 composed of a hard disk, an EEPROM (Electrically Erasable and ProgRAMmable Read Only Memory), and so forth, the communication section 65, and the drive 66.

20                 The communication section 65 is composed of for example an IEEE (Institute of Electrical and Electronics Engineers) 1394 port, a USB (Universal

Serial Bus) port, an NIC (Network Interface Card) connected to a LAN (Local Area Network), an analog modem, a TA (Terminal Adaptor), a DSU (Digital Service Unit), an ADSL (Asynchronous Digital Subscriber Line) modem, or the like. The communication section 65 exchanges data with the editing terminal device 16 through the network 12 for example the Internet or an intranet.

The drive 66 loads and unloads the optical disc 17. By driving the optical disc 17, the drive 66 can record video data and audio data to the optical disc 17 and reproduce video data and audio data from the optical disc 17.

The optical disc 17 is an optical disc on which a large capacity of data (for example, 27 Gigabytes) having a mark length of 0.14  $\mu\text{m}$  (minimum) and a track pitch of 0.32  $\mu\text{m}$  is recorded with a blue-purple laser having a numerical aperture (NA) of 0.85 and a wavelength of 405 nm. The optical disc 17 may be another type of a record medium. For example, the optical disc 17 may be one of various types of optical discs such as DVD-RAM (Digital Versatile Disc - Random Access Memory), DVD-R (DVD - Recordable), DVD-RW (DVD - ReWritable), DVD+R (DVD + Recordable), DVD+RW (DVD + ReWritable), CD-R (Compact Disc - Recordable), CD-RW (CD - ReWritable), or the like.

Video data, audio data, and so forth recorded

on the optical disc 17 are managed as one clip by the file system that will be described later with reference to Fig. 5. In the file system, a plurality of clips recorded on the optical disc 17 are managed by the index file and the clip information file. The index file is a management file that manages all clips. The clip information file is a management file that manages essence data of each clip.

When the optical disc is loaded into the drive 66, the index file is read from the drive 66 and stored to the RAM 53. When a clip to be reproduced is designated, the clip information file is read from the optical disc 66 and stored to the RAM 53. Hereinafter, video data, audio data, low resolution data, and so forth that compose a clip are referred to as essence data.

When necessary, a drive 67 is also connected to the input/output interface 60. The drive 67 is used when data are read from and written to a removable medium 71 composed of a record medium such as a magnetic disc, an optical disc, an optical-magnetic disc, a semiconductor memory, or the like.

Fig. 3 shows an example of the structure of the record control section 54 shown in Fig. 2. In the example shown in Fig. 3, the record control section 54 is composed of a data obtainment section 101, an information obtainment section 102, a data generation

section 103, a clip generation section 104, an index file update section 105, a data record section 106, and a table record section 107.

The data obtainment section 101 obtains video data, audio data, low resolution data, and so forth from the encoder/decoder section 56 or the storage section 64 and supplies them to the data generation section 103. When the CPU 51 causes the record control section 54 to start recording data, the information obtainment section 102 obtains parameter information from the RAM 53 and supplies the parameter information to the data generation section 103, the clip generation section 104, and the index file generation section 105. The parameter information is setup information for the photographing device 14 and used to input (photograph and record) video data and audio data from the input section 62. The parameter information is reproduction information such as information about resolution of video data and audio data that are input and the type of codec (encoding method). The parameter information has been set up in the photographing device 14 or is set up by the photographing staff member or the like and stored in the RAM 53 through the operation section 61.

The data generation section 103 generates each type of essence data (video data, audio data, and low resolution data) in a predetermined format (in this

case, MXF (Material eXchange Format) with video data, audio data, low resolution data, and so forth supplied from the data obtainment section 101 according to parameter information supplied from the information obtainment section 102 and outputs the essence data to the data record section 106. The data generation section 103 also generates meta data in a predetermined form according to the parameter information and so forth supplied from the information obtainment section 102 and outputs the meta data and so forth to the data record section 106.

When the parameter information has been input from the information obtainment section 102 to the clip generation section 104, it generates a clip directory to generate a new clip for data that will be input. In addition, the clip generation section 104 generates a clip information file that describes attribute information of each type of essence data necessary to reproduce each type of essence data generated by the data generation section 103 according to the parameter information supplied from the information obtainment section 102 and outputs the generated clip information file to the table record section 107.

The index file update section 105 generates clip elements corresponding to the generated clip according to the parameter information supplied from the information obtainment section 102 and updates the

index file that has been read from the optical disc 17  
and stored in the RAM 53 with the clip elements. The  
generated clip elements describe clip attribute  
information necessary to reproduce the clip. The index  
5 file update section 105 outputs the updated index file  
to the table record section 107.

The data record section 106 records the data  
generated by the data generation section 103 to the  
optical disc 17 through the drive 66. The table record  
10 section 107 records the clip directory, the clip  
information file, and so forth generated by the clip  
generation section 104 and the index file updated by  
the index file update section 105 to the optical disc  
17 through the drive 66.

15 Fig. 4 shows an example of the structure of  
the reproduction control section 55 shown in Fig. 2.  
In the example shown in Fig. 4, the reproduction  
control section 55 is composed of a clip reproduction  
section 111, a tape reproduction section 112, an index  
20 file information obtainment section 113, and a clip  
information obtainment section 114. The clip  
reproduction section 111 and the tape reproduction  
section 112 of the reproduction control section 55  
control the index file information obtainment section  
113 or the clip information obtainment section 114  
25 according to a clip reproduction start command or a  
tape reproduction start command issued from the CPU 51

and read data from the optical disc 17.

Although the clip reproduction is the reproduction for one clip, the tape reproduction is a successive clip reproduction process that successively reproduces all clips from the optical disc 17 in the order of which they were recorded as if data were reproduced from a tape.

When the clip reproduction section 111 inputs the clip reproduction start command from the CPU 51,  
10 the clip reproduction section 111 controls the index file information obtainment section 113 or the clip information obtainment section 114 to obtain information necessary to reproduce the corresponding clip, controls the drive 66 according to the obtained  
15 information, reads video data, audio data, low resolution data, or the like from the optical disc 17, and supplies the video data, audio data, low resolution data, or the like to the encoder/decoder section 56.

When the tape reproduction section 112 inputs the tape reproduction start command from the CPU 51,  
20 the tape reproduction section 112 controls the index file information obtainment section 113 or the clip information obtainment section 114 to obtain information necessary to reproduce the corresponding  
25 clips, controls the drive 66 according to the obtained information, reads video data, audio data, low resolution data, or the like from the optical disc 17,

and supplies the video data, audio data, low resolution data, or the like to the encoder/decoder section 56. In other words, the tape reproduction section 112 reads clips from the optical disc 17 in the order of which they were registered in the index file obtained from the index file information obtainment section 113 and outputs the clips.

5                   The index file information obtainment section 113 obtains information necessary to reproduce the corresponding clip(s) from the index file stored in the RAM 53 under the control the clip reproduction section 111 or the tape reproduction section 112 and outputs the information to the clip reproduction section 111 or the tape reproduction section 112.

10                  The clip information obtainment section 114 reads the corresponding clip information file from the optical disc 17 through the drive 66 under the control of the clip reproduction section 111 or the tape reproduction section 112 and stores the clip information file to the RAM 53. In addition, the clip information obtainment section 114 obtains information necessary to reproduce the corresponding clip(s) from the clip information file stored in the RAM 53 and outputs the information to the clip reproduction section 111 or the tape reproduction section 112.

15                  Next, the file system that manages data recorded on the optical disc 17 and the directory

structure and files of the file system will be described. In the file system, data recorded on the optical disc 17 are managed in the directory structure and files shown in Fig. 5.

5                 Fig. 5 shows an example of the structure of the file system of the optical disc 17. In Fig. 5, under a root directory (ROOT) 131, a PROAV directory 132 is placed. Under the PROAV directory 132, directories for information about essence data of video data, audio data, and so forth, an edit list that represents an edit result of essence data, and so forth are placed. Under the root directory 131, construction table data and so forth (not shown) are placed.

10

Under the PROAV directory 132, a disc meta file (DISCMETA.XML) 133 that is a file that contains titles and comments of all essence data recorded on the optical disc 17 and information such as a path to video data corresponding to a representative picture as a representative frame of all video data recorded on the optical disc 17, an index file (INDEX.XML) 134 that contains management information and so forth with which all clips and edit lists recorded on the optical disc 17 are managed, and an index file (INDEX.BUP) 135 are placed. The index file 135 is a copy of the index file (INDEX.XML) 134. With the two files, the reliability 20  
25 is improved.

Under the PROAV directory 132, a disc

information file (DISCINFO.XML) 136 that is a file that contains meta data of all data recorded on the optical disc 17, for example information such as disc attributes, reproduction start position, Reclnhi, or 5 the like and a disc information file (DISCINFO.BUP) 137 are placed. The disc information file 137 is a copy of the disc information file 136. With the two files, the reliability is improved. However, when these 10 information is updated, only the disc information file 136 may be updated.

Besides these files, under the PROAV directory 132, a clip root directory (CLPR) 138 whose lower directory contains data of clips and an edit list root directory (EDTR) 139 whose lower directory 15 contains data of edit lists are placed.

Under the clip directory 138, data of clips recorded on the optical disc 17 are managed with directories corresponding to clips. For example, in Fig. 5, data of three clips are managed with three 20 directories that are a clip directory (C0001) 141, a clip directory (C0002) 142, and a clip directory (C0003) 143. In other words, data of the first clip recorded on the optical disc 17 are managed as a file in a lower directory of the clip directory 141. Data 25 of the second clip recorded in the optical disc 17 are managed as a file in a lower directory of the clip directory 142. Data of the third clip recorded on the

optical disc 17 are managed as a file in a lower directory of the clip directory 143.

Each clip directory has rewrite and deletion prohibition attribute information. The rewrite and deletion prohibition attribute of data managed as a lower directory of each clip directory is managed according to rewrite and deletion prohibition attribute information of the upper clip directory.

Under the edit list root directory 139, edit lists recorded on the optical disc 17 are managed with directories corresponding to edit processes. In the case shown in Fig. 5, four edit lists are managed with four directories that are an edit list directory (E0001) 144, an edit list directory (E0002) 145, an edit list directory (E0003) 146, and an edit list directory (E0004) 147.

In other words, an edit list that represents the first edit result of a clip recorded on the optical disc 17 is managed as a file in a lower directory of the edit list directory 144. An edit list that represents the second edit result is managed as a file in a lower directory of the edit list directory 145. An edit list that represents the third edit result is managed as a file in a lower directory of the edit list directory 146. An edit list that represents the fourth edit result is managed as a file in a lower directory of the edit list directory 147.

A lower directory of the clip directory 141 under the clip root directory 138 contains and manages each type of data of the first clip recorded on the optical disc 17 as files shown in Fig. 6.

5 Fig. 6 shows an example of the structure of the clip directory 141 shown in Fig. 5. In the case shown in Fig. 6, the clip directory 141 contains a clip information file (C0001C01.SMI) 151 that is a file with which the clip is managed, a video data file  
10 (C0001V01.MXF) 152 that is a file contains video data of the clip, eight audio data files (C0001A01.MXF to C0001A08.MXF) 153 to 160 that are eight files that contain audio data of individual channels of the clip, a low resolution data file (C0001S01.MXF) 161 that is a file that contains low resolution data corresponding to video data of the clip, a clip meta data file  
15 (C0001M01.XML) 162 that is a file that contains clip meta data as meta data that do not need to be in real time corresponding to essence data of the clip, for example, a conversion table between LTC (Linear Time  
20 Code) and frame number, a frame meta data file (C0001R01.BIM) 163 that is a file that contains frame meta data that are meta data that need to be in real time corresponding to essence data of the clip, for example, LTC, a picture pointer file (C0001I01.PPF) 164  
25 that is a file that describes the frame structure of the video data file 152 (for example, information about

the compression format of each picture in MPEG or the  
like and information such as an offset address from the  
beginning of the file), and so forth. As described  
above, the rewrite and deletion prohibition attributes  
5 of these files are managed according to the rewrite and  
deletion prohibition information of the clip directory  
141.

In the case shown in Fig. 6, video data, low  
resolution data, and frame meta data that are data that  
10 need to be reproduced in real time are managed as  
different files so that their read times do not  
increase.

Likewise, audio data need to be reproduced in  
real time. To deal with audio data of multi channels  
15 such as 7.1 channels, eight channels are provided.  
They are managed as different files. In other words,  
audio data are managed as eight files. Instead, files  
for audio data may be seven files or less or nine files  
or larger.

20 Likewise, when necessary, video data, low  
resolution data, and frame metadata may be managed as  
two or more files each.

In Fig. 6, clip meta data that do not need to  
be in real time are managed as a file different from  
25 frame meta data that need to be in real time. This is  
because meta data are prevented from being  
unnecessarily reproduced while video data and so forth

are being normally reproduced. Thus, the process time of the reproduction process can be shortened and the load for the process can be lightened.

To allow the clip meta data file 162 to have versatility, the clip meta data file 162 is described in the XML (eXtensible Markup Language) format. However, to shorten the process time for the reproduction process and lighten the load for the process, the frame meta data file 163 is a BIM format file of which an XML format file has been compiled.

The example of the structure of the files in the clip directory 141 shown in Fig. 6 can be applied to all clip directories of clips recorded on the optical disc 17. In other words, the example of the structure of the files shown in Fig. 6 can be applied to the other directories 142 and 143 shown in Fig. 5. Thus, their description will be omitted.

Each file contained in a clip directory for one clip was described. However, the structure of files is not limited to the foregoing example. Instead, any structure may be used as long as a clip meta data file of a clip is contained in a lower director of each clip directory.

Next, an example of the structure of files contained in a lower directory of the edit list root directory 139 shown in Fig. 5 will be described. A lower directory of the edit list directory 145 under

the edit list root directory 139 contains and manages data of an edit list that is information about the second edit result of each type of data of a clip recorded on the optical disc 17 as files shown in Fig.

5 7.

Fig. 7 shows an example of the structure of the edit list directory 145 shown in Fig. 5. In the case shown in Fig. 7, the edit list directory 145 contains an edit list file (E0002E01.SMI) 171 that is a file with which the edit result (edit list) is managed, an edit list clip meta data file (E0002M01.XML) 172 that is a file that contains clip meta data corresponding to essence data of edited data (a portion extracted as edited data from essence data of all clips) or clip meta data newly generated according to the clip meta data, a play list file (E0002P01.SMI) 173 that is a file that contains information such as a reproduction procedure (play list) of essence data according to the edit result (edit list), a play list picture pointer file (E0002I01.PPF) 174 that is a file that describes the frame structure (for example, information about the compression format of each picture of MPEG or the like and information of an offset address from the beginning of the file) of video data reproduced according to the reproduction procedure contained in the play list file 173, a play list video data file (B0002V01.BMX) 175 that is a file that

contains video data that assure real time reproduction according to the reproduction procedure (play list) of the play list file 173, four play list audio data files (B0002A01.BMX to B0002A04.BMX) 176 to 179 that are four 5 files that contain audio data that assure real time reproduction according to the reproduction procedure (play list) of the play list file 173, a play list low resolution data file (B0002S01.BMX) 180 that is a file that contains low resolution data that assures real 10 time reproduction according to the reproduction procedure (play list) of the play list file 173, a play list frame meta data file (B0002R01.BRM) 181 that is a file that contains frame meta data that assure real 15 time reproduction according to the reproduction procedure (play list) of the play list file 173, and so forth.

In Fig. 7, clip meta data that do not need to be in real time are managed as a file different from frame meta data that need to be in real time. This is 20 because meta data are prevented from being unnecessarily reproduced while video data and so forth are being reproduced (the edit result is being reproduced) with the reproduction procedure (play list). Thus, the process time of the reproduction process can 25 be shortened and the load for the process can be lightened.

The edit list clip meta data file 172 is a

file that contains new clip data generated according to  
clip meta data (a clip meta data file contained in a  
lower directory of the clip root directory 138) of a  
clip used for editing data according to an edit result.  
5 Whenever data are edited, the edit list clip meta data  
file is generated. The edit list clip meta data file  
172 is described in the XML format so that the file has  
versatility.

Video data contained in the play list video  
10 data file 175, audio data contained in the play list  
audio data files 176 to 179, low resolution data  
contained in the play list low resolution data file 180,  
and frame meta data contained in the play list frame  
meta data file 181 are data extracted from video data,  
audio data, low resolution data, and frame meta data of  
15 a clip corresponding to the edit result and managed in  
a lower directory of the clip root directory 138 shown  
in Fig. 6. These data are read when a reproduction  
process is preformed according to a reproduction  
procedure (play list) contained in the play list file  
20 173. Since data of these edit results are provided,  
when a reproduction process is performed according to a  
play list, the number of files to be read can be  
decreased. Thus, the process time can be shortened and  
25 the load for the process can be lightened.

When necessary, video data, low resolution  
data, and frame meta data may be managed as a plurality

of files each. Likewise, the number of files of audio data may be three or less or five or more.

The play list frame meta data file 181 is a BBM format file corresponding to the BIM format of which an XML format file has been compiled so that the process time for the reproduction process is shortened and the load for the process is lightened.

The forgoing example of the structure of the files in the edit list directory 145 shown in Fig. 7 can be applied to all edit lists (edit results). In other words, the example of the structure of the files shown in Fig. 7 can be applied to the other edit list directory 144, 146, or 147 shown in Fig. 5. Thus, the description of these directories will be omitted.

Each file contained in the edit list directory for one edit operation has been described. However, the structure of files is not limited to the foregoing example. Instead, any structure may be applied as long as edit list clip meta data files for an edit operation are contained in a lower directory of each edit list directory.

Next, the index file of the file system of the optical disc 17 will be described. As described above, the index file is composed of a clip table (clipTable) that describes management information with which all clips recorded on the optical disc 17 are totally managed and an edit list table (editlistTable)

that describes management information with which all edit lists recorded on the optical disc 17 are managed. The clip table also contains management information for essence data (video data, audio data, low resolution data, and so forth) of each clip. The edit list table contains meta data of edit lists and management information for play lists and so forth. The index file is a file mainly used on the optical disc 17 to manage data recorded thereon. The index file is managed in the XML format according to a unique schema.

Fig. 8 shows an example of the index file 134 shown in Fig. 5. In Fig. 8, a numeral and a colon sign (:) at the beginning of each line are added for explanation purpose. Thus, they are not a part of a code. A plus sign (+) followed by an unequal sign (<) represents that the line has a child element. Likewise, the plus sign is not also a part of a code. These rules are applied to codes shown in Fig. 9 to Fig. 14.

```
<?xml version = "1.0" encoding = "UTF-8" ?>,  
line 1, represents that the index file 134 starting  
from line 2 is described in XML format, version "1.0"  
and encoded according to UTF-8. In the example shown  
in Fig. 8, between <indexFile xmlns = urn:schemas-  
professionalDisc:index:2003" xmlns:xsi =  
"http://www.w3.org/2001/XMLSchema-instance"  
xsi:noNamespaceSchemaLocation = "index.xsd">, line 2 to  
line 4, and </indexFile>, line 7, the index file 134 is
```

described in an XML format defined by schema "schemas-professionalDisc."

5           <clipTable path = "/PROAV/CLPR/">, line 5, represents a clip table with which all clips on the optical disc 17 are managed and that all clips managed with the clip table are recorded under [/PROAV/CLPR/] of the optical disc 17. Child elements contained in the clip table of <clipTable path = "/PROAV/CLPR/">, line 5, will be described with reference to Fig. 9.

10          <editlistTable path = "/PROAV/EDTR/">, line 6, represents an edit list table with which all edit lists on the optical disc 17 are managed and that all edit lists managed with the edit list table are recorded under [/PROAV/EDTR/] on the optical disc 17. Child elements contained in the edit list table of <editlistTable path = "/PROAV/EDTR/">, line 6, will be described later with reference to Fig. 11.

15          Fig. 9 shows an example of the clip table of <clipTable path = "/PROAV/CLPR/">, line 5, Fig. 8. In the clip table shown in Fig. 9, between <clipTable path = "/PROAV/CLPR/"> tag, line 1, and </clipTable> tag, line 18, clips recorded on the optical disc 17 are described as clip elements in the order of which they were recorded.

20          25        <clip id = "C0001" umid = "0123456789ABCDEF  
0123456789ABCDEF0123456789AA" file = "C0001C01.SMI" fps  
= "59.94i" dur = "12001" ch = "4" aspectRatio = "4:3">

line 2 to line 5, represents a clip element of the first clip recorded on the optical disc 17.

Firstly, [clip id = "C0001" umid = "0123456789ABCDEF0123456789ABCDEF0123456789AA" file = "C0001C01.SMI"], line 2 to line 5, will be described. [clip id = "C0001"] represents that the clip ID that is information that uniquely identifies each clip on the optical disc 17 is ["C0001"]. [umid = "0123456789 ABCDEF0123456789ABCDEF0123456789AA"] represents a worldwide unique identifier umid (unique material identifier, which will be described later with reference to Fig. 13), assigned to this clip with 22 bytes of 32 bytes excluding a common part of the first 10 bytes. [file = "C0001C01.SMI"] represents the file name of the clip information file that describes management information with which the clip recorded on the optical disc 17 is managed.

In other words, [clip id = "C0001" umid = "0123456789ABCDEF0123456789ABCDEF0123456789AA" file = "C0001C01.SMI"] is information about a conversion table necessary to obtain the clip information file of the clip identified by the clip ID or umid. When the clip ID or umid is designated, the file name of the clip information file of the corresponding clip is obtained with reference to the index file. With reference to the file name and [path = "/PROAV/CLPR/"], line 1, Fig. 9, the position of the clip information file recorded

on the optical disc 17 can be obtained.

10 bytes of Univ Label (Universal Label) represented by the first 12 bytes of umid are a fixed header that represents umid. Umid of the index file is information that is converted into a file name. Unlike umid described in a clip information file or the like, umid of the index file is not often used outside the optical disc 17. Thus, umid of the index file is described without the first 10 bytes. As a result, the capacity of the index file can be decreased.

[fps = "59.94i" dur = "12001" ch = "4" aspectRatio = "4:3"], line 2 to line 5, describes attribute information necessary to reproduce the clip. [fps = "59.94i"] represents that the resolution in the time base direction is 59.94 field/sec and that the reproduction method for the clip is based on the interlace system. [dur = "12001"] represents that the effective length of the clip in the time direction is 1201 frames. [ch = "4"] represents that the number of channels of audio data that compose the clip is four channels. [aspectRatio = "4:3"] represents that the aspect ratio of video data that compose the clip is "4:3".

Among these attribute information, [fps = "59.94i" ch = "4" aspectRatio = "4:3"] is described as setup information that is input for the photographing device 14 with the input section 62 to input

(photograph and record) video data and audio data according to their parameter information (information about resolution, type of codec, and so forth) stored in the RAM 53.

5           Since the structure of each of the clip elements of clip ID "C0002" to "C0004" is basically the same as that of the clip element of clip ID "C0001," their description will be omitted. <clip id = "C0002" umid = "0123456789ABCDEF0123456789ABCDEF0123456789AB" file = "C0002C01.SMI" fps = "59.94i" dur = "4000" ch = "4" aspectRatio = "4:3">, line 6 to line 9, represents a clip element as the next clip of the clip of clip ID "C0001" recorded on the optical disc 17. This statement represents that the clip ID is ["C0002"],

10          umid is ["0123456789ABCDEF0123456789ABCDEF0123456789AB"], the file name of the clip information file is ["C0002C01.SMI"], the resolution of the clip in the time base direction is 59.94 field/sec, the reproduction method for the clip is based on the interlace system, the effective length of the clip in the time direction is 4000 frames, the number of channels of audio data that compose the clip is four channel, and the aspect ratio of video data that compose the clip is "4:3."

15          20          25          <clip id = "C0003" umid = "0123456789ABCDEF0123456789ABCDEF0123456789AC" file = "C0003C01.SMI" fps = "59.94i" dur = "10000" ch = "4" aspectRatio = "4:3">,

line 10 to line 13, represents a clip element as the  
next clip of the clip of clip ID "C0002" recorded on  
the optical disc 17. This statement represents that  
the clip ID is ["C0003"], umid is ["0123456789ABCDEF  
5 0123456789ABCDEF0123456789AC"], the file name of the  
clip information file is ["C0003C01.SMI"], the  
resolution of the clip in the time base direction is  
59.94 field/sec, the reproduction method for the clip  
is based on the interlace system, the effective length  
10 of the clip in the time direction is 10000 frames, the  
number of channels of audio data that compose the clip  
is four channel, and the aspect ratio of video data  
that compose the clip is "4:3."

<clip id = "C0004" umid = "0123456789ABCDEF  
15 0123456789ABCDEF0123456789AD" file = "C0004C01.SMI" fps  
= "59.94i" dur = "12001" ch = "4" aspectRatio = "16:9">,  
line 14 to line 17, represents a clip element as the  
next clip of the clip of clip ID "C0003" recorded on  
the optical disc 17. This statement represents that  
20 the clip ID is ["C0004"], umid is ["0123456789ABCDEF  
0123456789ABCDEF0123456789AD"], the file name of the  
clip information file is ["C0004C01.SMI"], the  
resolution of the clip in the time base direction is  
59.94 field/sec, the reproduction method for the clip  
is based on the interlace system, the effective length  
25 of the clip in the time direction is 12001 frames, the  
number of channels of audio data that compose the clip

is four channel, and the aspect ratio of video data that compose the clip is "16:9."

As described above, clip elements composed of clip ID, umid, information about file name conversion table for clip information file, and attribute information necessary to reproduce the clip are described in the clip table of the index file in the order of which the clip elements are recorded on the optical disc 17.

Fig. 10 shows an example of a clip element of clip ID ["C0001"] of [<clip id = "C0001" umid = "0123456789ABCDEF0123456789ABCDEF0123456789AA" file = "C0001C01.SMI" fps = "59.94i" dur = "12001" ch = "4" aspectRatio = "4:3">], line 2 to line 5, Fig. 9. In the clip element shown in Fig. 10, between <clip id = "C0001" umid = "0123456789ABCDEF0123456789ABCDEF 0123456789AA" file = "C0001C01.SMI" fps = "59.94i" dur = "12001" ch = "4" aspectRatio = "4:3"> tag, line 2 and line 2, and </clip> tag, line 17, essence data that composes the clip are described as clip child elements.

<video umid = "0123456789ABCDEF0123456789 ABCDEF0123456789A1" file = "C0001V01.MXF" type = "DV25\_411P"/>, line 3 to line 4, represents a clip child element of a video data file that composes the clip.

Firstly, [umid = "0123456789ABCDEF0123456789 ABCDEF0123456789A1" file = "C0001V01.MXF"], line 3 and

line 4, will be described. Like the case shown in Fig. 9, [umid = "0123456789ABCDEF0123456789ABCDEF0123456789A1"] is a worldwide unique identifier umid (unique material identifier) assigned to the video data file with 22 bytes of 32 bytes excluding the common part of the first 10 bytes. [file = "C0001V01.MXF"] represents the file name of the video data file that composes the clip recorded on the optical disc 17.

In other words, [umid = "0123456789ABCDEF0123456789ABCDEF0123456789A1"] is information about a conversion table necessary to obtain the file name of the clip essence data file (in this case, a video data file) of the clip identified by umid. When umid is designated, the file name of the corresponding clip essence data file (in this case, a video data file) is obtained with reference to the index file. With reference to the file name and [path = "/PROAV/CLPR/"], line 2, Fig. 9, the position of the essence data file recorded on the optical disc 17 can be obtained.

[type = "DV25\_411P"], line 3 and line 4, describes attribute information of the video data file necessary to reproduce the essence data file (in this case, the video data file). [type = "DV25\_411P"] represents that the type of codec of the video data file is ["DV25\_411P"]. Like the attribute information of the clip element shown in Fig. 9, the attribute information [type = "DV25\_411P"] is described as setup

information that is input for the photographing device  
14 with the input section 62 to input (photograph and  
record) video data and audio data according to their  
parameter information (information about resolution,  
5 type of codec, and so forth) stored in the RAM 53.

Since the structure of each of clip child  
elements of an audio data file, a low resolution data  
file, a clip meta data file, and a frame meta data file  
that compose a clip is basically the same as the  
10 structure of a clip child element of a video data file,  
their description will be omitted. <audio umid =  
"0123456789ABCDEF0123456789ABCDEF0123456789A2" file =  
"C0001A01.MXF" type "LPCM16" cast = "CH1"/>, line 5 and  
line 6, represents a clip child element of an audio  
data file that composes the clip. This statement  
15 represents that umid is [umid = "0123456789ABCDEF  
0123456789ABCDEF0123456789A2"], that the file name of  
the audio data file is "C0001A01.MXF", that the type of  
codec of the audio data file is ["LPCM16"], and that  
this audio data file is reproduced as channel 1 ("CH1").  
20 When a child element is an audio data file, the child  
element describes ["cast = "CH1"] as channel  
information of which the audio data file is reproduced.

<audio umid = "0123456789ABCDEF0123456789  
25 ABCDEF0123456789A3" file = "C0001A02.MXF" type "LPCM16"  
cast = "CH2"/>, line 7 and line 8, represents a clip  
child element of an audio data file that composes the

clip. This statement represents that umid is [umid = "0123456789ABCDEF0123456789ABCDEF0123456789A3"], that the file name of the audio data file is "C0001A02.MXF", that the type of codec of the audio data file is ["LPCM16"], and that this audio data file is reproduced as channel 2 ("CH2").

5                   <audio umid = "0123456789ABCDEF0123456789  
ABCDEF0123456789A4" file = "C0001A03.MXF" type "LPCM16"  
cast = "CH3"/>, line 9 and line 10, represents a clip  
10                 child element of an audio data file that composes the  
clip. This statement represents that umid is [umid =  
"0123456789ABCDEF0123456789ABCDEF0123456789A4"], that  
the file name of the audio data file is "C0001A03.MXF",  
that the type of codec of the audio data file is  
15                 ["LPCM16"], and that this audio data file is reproduced  
as channel 3 ("CH3").

15                 <audio umid = "0123456789ABCDEF0123456789  
ABCDEF0123456789A5" file = "C0001A04.MXF" type "LPCM16"  
cast = "CH4"/>, line 11 and line 12, represents a clip  
20                 child element of an audio data file that composes the  
clip. This statement represents that umid is [umid =  
"0123456789ABCDEF0123456789ABCDEF0123456789A5"], that  
the file name of the audio data file is "C0001A04.MXF",  
that the type of codec of the audio data file is  
25                 ["LPCM16"], and that this audio data file is reproduced  
as channel 4 ("CH4").

<subStream umid = "0123456789ABCDEF0123456789

ABCDEF0123456789A6" file = "C0001S01.MXF" type = "PD-SubStream"/>, line 13 and line 14, represents a clip child element of a low resolution data file that composes the clip. This statement represents that umid is [umid = "0123456789ABCDEF0123456789ABCDEF0123456789A6"], that the file name of the low resolution data file is "C0001S01.MXF", and that the type of codec of the low resolution data file is ["PD-SubStream"].

10                   <meta file = "C0001M01.XML" type = "PD-Meta"/>, line 15, represents a clip child element of a clip meta data file that composes the clip. This statement represents that the file name of the clip meta data file is ["C0001M01.XML"] and that the type of 15                   codec is ["PD-Meta"].

15                   <rtmeta file = "C0001R01.BIM" type = "std"/>, line 16, represents a clip child element of a frame meta data file that composes the clip. This statement represents that the file name of the frame meta data 20                   file is ["C0001R01.BIM"] and that the type of codec is ["std"]. In this case, although umid is not designated to the clip meta data file and the frame meta data file, umid may be designated thereto.

25                   As described above, the clip table of the index file describes umid of the essence data that composes the clip, information about the file name conversion table of the essence data, and attribute

information (type of codec and resolution) necessary to reproduce the essence data that compos the clip. Thus, when only the index file is read, information necessary to reproduce the clip is obtained. Thus, when only  
5 essence data that composes a clip is read from the optical disc 17 according to the obtained file name, the clip can be reproduced. In other words, the process time that takes after the reproduction is designated until the reproduction is preformed is  
10 shortened.

The example of the structure of the clip element of clip ID ["C0001"] shown in Fig. 10 can be applied to clip elements of all clip IDs of clips recorded on the optical disc 17. In other words, since  
15 the example of the structure of the clip element shown in Fig. 10 can be applied to other clip elements of clip IDs ["C0002"] to ["C0004"] shown in Fig. 9, their description will be omitted.

Fig. 11 shows an example of the edit list  
20 table of [<editlistTable path = "/PROAV/EDTR/">], line 6, Fig. 8. In the edit list table shown in Fig. 11, between <editlistTable path = "/PROAV/EDTR/"> tag, line 1, and </editlistTable> tag, line 18, edit lists as edit results of clips recorded on the optical disc 17  
25 are described as edit list elements in the order of which they were edited. Since the structure of the edit lists shown in Fig. 11 is basically the same as

the structure of clips as elements described in the table exemplified in Fig. 9, the detail description will be omitted.

5           <editlist id = "E0001" umid = "0123456789  
ABCDEF0123456789ABCDEF0123456789BB" file =  
"E0001E01.SMI" dur = "500" fps = "59.94i" ch = "4"  
aspectRatio = "4:3">, line 2 to line 5, Fig. 11,  
represents the first edit list element as an edit  
result of a clip recorded on the optical disc 17. This  
10 statement represents that the edit ID is ["E0001"],  
that umid is ["0123456789ABCDEF0123456789  
ABCDEF0123456789BB"], and that the file name of the  
edit list file is ["E0001E01.SMI"]. In addition, this  
statement represents that as attribute information of  
15 the edit list, the effective length of the edit list in  
the time direction is 500 frames, the resolution of the  
edit list in the time base direction is 59.94 field/sec,  
the reproduction method of the edit list is based on  
the interlace system, and the number of channels of the  
20 audio data reproduced according to the edit list is  
four channels, and the aspect ratio of video data  
reproduced according to the edit list is [4:3].

          <editlist id = "E0001" umid = "0123456789  
ABCDEF0123456789ABCDEF0123456789BC" file =  
"E0002E01.SMI" dur = "500" fps = "59.94i" ch = "4"  
aspectRatio = "4:3">, line 6 to line 9, represents an  
edit list element as an edit result of a clip after the

edit list of edit list ID ["E0001"]. This statement  
represents that the edit ID is ["E0002"], that umid is  
["0123456789ABCDEF0123456789ABCDEF0123456789BC"], and  
that the file name of the edit list file is  
5 ["E0002E01.SMI"]. In addition, this statement  
represents that as attribute information of the edit  
list, the effective length of the edit list in the time  
direction is 500 frames, the resolution of the edit  
list in the time base direction is 59.94 field/sec, the  
reproduction method of the edit list is based on the  
10 interlace system, and the number of channels of the  
audio data reproduced according to the edit list is  
four channels, and the aspect ratio of video data  
reproduced according to the edit list is [4:3].  
15 <editlist id = "E0003" umid = "0123456789  
ABCDEF0123456789ABCDEF0123456789BD" file =  
"E0003E01.SMI" dur = "500" fps = "59.94i" ch = "4"  
aspectRatio = "4:3">, line 10 to line 13, represents an  
edit list element as an edit result of a clip after the  
20 edit list of edit list ID ["E0002"]. This statement  
represents that the edit ID is ["E0003"], that umid is  
["0123456789ABCDEF0123456789ABCDEF0123456789BD"], and  
that the file name of the edit list file is  
["E0003E01.SMI"]. In addition, this statement  
25 represents that as attribute information of the edit  
list, the effective length of the edit list in the time  
direction is 500 frames, the resolution of the edit

list in the time base direction is 59.94 field/sec, the reproduction method of the edit list is based on the interlace system, and the number of channels of the audio data reproduced according to the edit list is four channels, and the aspect ratio of video data reproduced according to the edit list is [4:3].

5           <editlist id = "E0004" umid = "0123456789  
ABCDEF0123456789ABCDEF0123456789BE" file =  
"E0003E01.SMI" dur = "500" fps = "59.94i" ch = "4"  
10          aspectRatio = "16:9">, line 14 to line 17, represents  
an edit list element as an edit result of a clip after  
the edit list of edit list ID ["E0003"]. This  
statement represents that the edit ID is ["E0004"],  
that umid is ["0123456789ABCDEF0123456789ABCDEF  
0123456789BE"], and that the file name of the edit list  
15          file is ["E0004E01.SMI"]. In addition, this statement  
represents that as attribute information of the edit  
list, the effective length of the edit list in the time  
direction is 500 frames, the resolution of the edit  
list in the time base direction is 59.94 field/sec, the  
reproduction method of the edit list is based on the  
20          interlace system, and the number of channels of the  
audio data reproduced according to the edit list is  
four channels, and the aspect ratio of video data  
reproduced according to the edit list is [4:3].

25          Fig. 12 shows an example of the structure of  
an edit list element of edit list ID "E0001" of

[<editlist id = "E0001" umid = "0123456789ABCDEF  
0123456789ABCDEF0123456789BB" file = "E0001E01.SMI" dur  
= "500" fps = "59.94i" ch = "4" aspectRatio = "4:3">>],  
line 2, Fig. 11. In the edit list element shown in Fig.  
5 12, between <editlist id = "E0001" umid = "0123456789  
ABCDEF0123456789ABCDEF0123456789BB" file =  
"E0001E01.SMI" dur = "500" fps = "59.94i" ch = "4"  
aspectRatio = "4:3">> tag, line 1 to line 4, and  
</editlist> tag, line 7, data that compose the edit  
10 list are described as an edit list child element.

<playlist file = "E0001P01.SMI"/>, line 5,  
represents an edit list child element of the play list  
file that is information about the reproduction order  
(play list) of essence data according to the edit list  
15 (edit result). This statement represents that the file  
name of the play list file is ["E0001P01.SMI"].

<meta file = "E0001M01.XML" type = "PD-  
Meta"/>, line 6, represents an edit list child element  
of the clip meta data file of the edit list. This  
20 statement represents that the file name of the clip  
meta data file of the edit list is ["E0001M01.XML"] and  
that the type of codec of the clip meta data file of  
the edit list is ["PD-Meta"]. In this case, although  
umid is not designated to the play list file and the  
25 meta data file, umid may be designated thereto.

As described above, edit list elements  
composed of edit list ID, umid, information about file

name conversion table for edit list file, and attribute information necessary to reproduce the edit list are described in the edit list table of the index file in the order of which the edit list elements are edited.

5           The example of the structure of the edit list element of edit list ID ["E0001"] shown in Fig. 12 can be applied to edit list elements of edit list IDs of edit lists recorded on the optical disc 17. In other words, since the example of the structure of the edit 10 list element shown in Fig. 12 can be applied to other edit list elements of edit list IDs ["E0002"] to ["E0004"] shown in Fig. 11, their description will be omitted.

15           Next, the clip information file of the file system of the optical disc 17 will be described. As described above, the clip information file contains management information with which each clip recorded on the optical disc 17 is managed. To allow the clip information file to have versatility, the clip 20 information file is described in SMIL (Synchronized Multimedia Integration Language) in the XML format.

Fig. 13 and Fig. 14 show an example of a code from <body> tag, which is a start tag to </body> tag, which is an end tag, of the clip information file 151 shown in Fig. 6. Fig. 13 shows line 1 to line 20 of the code. Fig. 14 shows line 21 to line 42 of the code. Besides the code from <body> tag to </body> tag of the

clip information file 151 shown in Fig. 13 and Fig. 14, the clip information file 151 contains information that represents that the clip information file 151 is described in SMIL, header information that contains 5 information about the clip meta data of the clip (for example, the clip meta data file 162 shown in Fig. 6), and so forth (not shown in Fig. 13 and Fig. 14).

<par> tag, line 2, and </par> tag, line 41, represent that essence data described therebetween are reproduced in parallel. <switch> tag, line 3, and </switch> tag, line 38, represent that one type of essence data described therebetween is selected and reproduced. [<! -- main stream -->], line 4, is a command tag that represents that essence data described between <par systemComponent = "IMX50"> tag, line 5, to </par> tag, line 33, are main line data (original video data and audio data).

[systemComponent = "IMX50"] of <par systemComponent = "IMX50"> tag, line 5, represents the 20 type of codec of video data that the photographing device 14 can reproduce (or needs to reproduce). Thus, <par systemComponent = "IMX50">, line 5, represents that essence data described from this tag to </par> tag, line 33, are simultaneously reproduced when the type of 25 codec of video data of the essence data described between these tags is [IMX50].

<video src = "urn:smpTE:umid:060A2B3401010

10501010D12130000000123456789ABCDEF0123456789ABCDEF"

type "IMX50> describes attribute information of video  
data to be reproduced. ["src = "urn:smpte:umid:  
060A2B3401010501010D12130000000123456789ABCDEF  
5 0123456789ABCDEF"] represents that video data (for  
example, the video data file 152) of ["umid:060A2B34  
01010501010D12130000000123456789ABCDEF  
0123456789ABCDEF"] defined in SMPTE (Society of Motion  
Picture and Television Engineers) are to be reproduced.  
10 [type = "IMX50"] represents the codec type as  
additional information necessary to reproduce video  
data. Thus, this statement, line 6 to line 8,  
represents that the video data file 152 is reproduced  
according to [IMX50].

15 umid (unique material identifier) is a  
worldwide unique identifier (ID) assigned to data to be  
referenced. umid (UMID) is categorized as basic UMID  
(32 bytes) and extended UMID (32 bytes). Basic UMID  
(32 bytes) is a unique ID for video data, audio data,  
20 and so forth. Extended UMID represents a source pack  
(time, place, photographer, and so forth). Extended  
UMID is added to basic UMID to represent the  
characteristic of pictures and to retrieve data. In  
this manner, in the clip information file, essence data  
25 are managed with umid. Thus, on the optical disc 17,  
it is necessary to convert umid into a file name with  
the index file. However, since umid has versatility,

it can be used by other devices.

5           <audio src = "urn:smpte:umid:060A2B3401010  
10501010D12130000000123456789ABCDEF0123456789ABCDEF0"  
type "LPCM16" trackDst = "CH1"/> describes attribute  
information of audio data to be reproduced. [type =  
"LPCM16"] represents that audio data are reproduced  
according to LPCM16. [trackDst = "CH1"] represents  
that this audio data are reproduced as channel 1. Thus,  
this statement, line 10 to line 12, represents that  
10          audio data of [umid:060A2B340101010501010D121300000000  
123456789ABCDEF0123456789ABCDEF0] (for example, the  
audio data file 153) are reproduced as channel 1  
according to LPCM16.

Likewise, <audio src = "urn:smpte:umid:  
15          060A2B340101010501010D12130000000123456789ABCDEF0123456  
789ABCDEF01" type "LPCM16" trackDst = "CH2"/>, line 12  
to line 14, represents audio data (for example, the  
audio data file 154) of [umid:060A2B340101010501010D  
12130000000123456789ABCDEF0123456789ABCDEF01] are  
20          reproduced as channel 2 according to LPCM16. <audio  
src = "urn:smpte:umid: 060A2B340101010501010D1213  
0000000123456789ABCDEF0123456789ABCDEF012" type  
"LPCM16" trackDst = "CH3"/>, line 15 to line 17,  
represents audio data (for example, the audio data file  
25          155) of [umid:060A2B340101010501010D1213000000  
0123456789ABCDEF0123456789ABCDEF012] are reproduced as  
channel 3 according to LPCM16. <audio src =

"urn:smpTE:umid: 060A2B340101010501010D12130000000  
123456789ABCDEF0123456789ABCDEF0123" type "LPCM16"  
trackDst = "CH4"/>, line 18 to line 20, represents  
audio data (for example, the audio data file 156) of  
5 [umid:060A2B340101010501010D12130000000123456789.  
ABCDEF0123456789ABCDEF0123] are reproduced as channel 4  
according to LPCM16.

In addition, <audio src = "urn:smpTE:umid:  
060A2B340101010501010D12130000000123456789ABCDEF0123456  
10 789ABCDEF01234" type "LPCM16" trackDst = "CH5"/>, line  
21 to line 23, represents audio data (for example, the  
audio data file 157) of [umid:060A2B340101010501010D  
12130000000123456789ABCDEF0123456789ABCDEF01234] are  
reproduced as channel 5 according to LPCM16. <audio  
15 src = "urn:smpTE:umid: 060A2B340101010501010D  
12130000000123456789ABCDEF0123456789ABCDEF012345" type  
"LPCM16" trackDst = "CH6"/>, line 24 to line 26,  
represents audio data (for example, the audio data file  
158) of [umid:060A2B340101010501010D1213000000  
20 0123456789ABCDEF0123456789ABCDEF012345] are reproduced  
as channel 6 according to LPCM16.

In addition, <audio src = "urn:smpTE:umid:  
060A2B340101010501010D12130000000123456789ABCDEF0123456  
789ABCDEF0123456" type "LPCM16" trackDst = "CH7"/>,  
25 line 27 to line 29, represents audio data (for example,  
the audio data file 159) of [umid:060A2B340101010  
501010D12130000000123456789ABCDEF0123456789ABCDEF012345

6] are reproduced as channel 7 according to LPCM16.

<audio src = "urn:smpte:umid: 060A2B34010101050  
1010D12130000000123456789ABCDEF0123456789ABCDEF01234567  
" type "LPCM16" trackDst = "CH8"/>, line 30 to line 32,  
represents audio data (for example, the audio data file  
160) of [umid:060A2B340101010501010D1213000000  
0123456789ABCDEF0123456789ABCDEF01234567] are  
reproduced as channel 8 according to LPCM16.

[<!-- sub stream -->], line 34, is a comment  
tag that represents that essence data described from  
line 35 to line 37 are low resolution data.

<ref src = "urn:smpte:umid:060A2B340  
101010501010D12130000000123456789ABCDEF012345678" type  
= "SubStream" systemComponent = "SubStream"/>, line 35  
to line 37, describes attribute information of any data  
(in this case, low resolution data) to be reproduced.

[type = "SubStream"] represents that low resolution  
data are reproduced according to codec SubStream.

[systemComponent = "SubSystem"] represents the type of  
codec of low resolution data that the photographing  
device 14 can reproduce (or needs to reproduce). Thus,  
the statement, line 35 to line 37, represents that low  
resolution data (for example, the low resolution data  
file 161) of [urn:smpte:umid:060A2B3401010105  
01010D12130000000123456789ABCDEF012345678] are  
reproduced according to codec SubStream.

[<!-- realtime meta -->], line 39, is a

command tag that represents that essence data described in line 41 is real time data.

5           <metastream src = "C0001R01.BIM" type =  
"std"/>, line 40, describes attribute information of  
meta data to be reproduced. [src = "C0001R01.BIM"]  
represents the file name of frame meta data. [type =  
"std"] represents that the frame data are reproduced  
according to codec [std]. Thus, the statement, line 35  
to line 37, represents that frame meta data (for  
10 example, the frame meta data file 163) of file name  
["C0001R01.BIM"] are reproduced according to [std].

Thus, the clip information file 151 shown in Fig. 13 and Fig. 14 represents that the video data file 152 and the audio data files 153 to 160 or the low resolution data file 161 is selected and reproduced along with the frame meta data file 163.

15           As described above, the clip information file contains additional information of essence data necessary to reproduce the essence data that compose a  
clip. Thus, when the clip information file is referenced, additional information of essence data can be readily obtained as information necessary to reproduce the essence data without need to read the essence data and interpret information necessary to  
20           reproduce the essence data.  
25

In the clip information file, versatile SMIL is used. In addition, essence data that compose a clip

is managed with versatile umid. Thus, the clip information file can be readily used by other devices. In this case, the clip information file may be used for processes that edit and reproduce essence data.

5 Next, with reference to a flow chart shown in Fig. 15, a read process for the index file will be described. The read process for the index file is executed when the optical disc 17 is loaded into the photographing device 14.

10 The photographing staff member loads the optical disc 17 into the drive 66 to record video data and audio data that are photographed by the photographing device 14 or to reproduce video data and audio data from the optical disc 17.

15 At step S1, the CPU 51 waits until the optical disc 17 has been loaded into the drive 66. When the CPU 51 has determined that the optical disc 17 had been loaded into the drive 66, the flow advances to step S2. At step S2, the CPU 51 controls the drive 66 20 to read the index file (for example, the index file 134) from the optical disc 17, stores (loads) the index file to the RAM 53, and completes the read process for the index file.

25 Thus, when the optical disc 17 is loaded into the drive 66 of the photographing device 14, the index file is read from the optical disc 17 and stored to the RAM 53. Thereafter, the data write process and data

read process for the optical disc 17 are executed according to the index file stored in the RAM 53. Thus, data recorded on the optical disc 17 can be quickly accessed.

5 Next, with reference to a flow chart shown in Fig. 16, a clip generation process of the photographing device 14 will be described. In this case, it is assumed that the optical disc 17 has been loaded into the photographing device 14, the read process for the  
10 index file described with reference to Fig. 15 has been executed, and the index file (for example, the index file 134) has been stored in the RAM 53. This assumption will be applied to processes shown in Fig.  
17 to Fig. 20.

15 The photographing staff member operates a record button that composes the operation section 61 and causes the photographing device 14 to record video data and audio data that it photographs to the optical disc 17. The operation section 61 outputs a data record command signal to the CPU 51. When the data record command signal has been input from the operation section 61, the CPU 51 causes the input section 62, the encoder/decoder section 56, the record control section 54, and the optical disc 17 to start recording data to  
20 the optical disc 17. At this point, parameter information (information about resolution, type of  
25 codec, and so forth) of video data and audio data has

been set by the photographing staff member through the operation section 61 and stored in the RAM 53 (or the parameter information that had been preset in the photographing device 14 may have been stored in the RAM 53).

The input section 62 inputs video data photographed by the camera and audio data collected by the microphone according to a command issued from the CPU 51 and supplies the video data and audio data to the encoder/decoder section 56. The encoder/decoder section 56 encodes the video data and audio data supplied from the input section 62 according to the parameter information stored in the RAM 53 and supplies the encoded video data, audio data, and low resolution data to the data obtainment section 101.

The information obtainment section 102 of the record control section 54 waits until the record start command has been issued from the CPU 51 at step S21 shown in Fig. 16. When the information obtainment section 102 has determined that the data record start command had been issued from the CPU 51, the flow advances to step S22. At step S22, the information obtainment section 102 obtains the parameter information stored in the RAM 53 and supplies the parameter information to the data generation section 103, the clip generation section 104, and the index file update section 105. At this point, the data

obtainment section 101 supplies the video data, audio data, and low resolution data supplied from the encoder/decoder section 56 to the data generation section 103.

5           When the clip generation section 104 has input the parameter information from the information obtainment section 102, the flow advances to step S23. At step S23, the clip generation section 104 generates the clip directory (for example, the clip directory 141) with which video data, audio data, and low resolution data inputted to the photographing device 14 are managed as clips and outputs the generated clip directory to the table record section 107. Thereafter, the flow advances to step S24. At step S24, the table record section 107 records the clip directory supplied from the clip generation section 104 to the optical disc 17 through the drive 66.

10

15

At step S24, the data generation section 103 generates the header and footer of essence data supplied from the data obtainment section 101 according to the parameter information supplied from the information obtainment section 102, generates MXF essence data files (for example, the video data file 152, the audio data files 153 to 160, and the low resolution data file 161) composed of the generated header, footer, and body and outputs the generated essence data files to the data record section 106.

20

25

Thereafter, the flow advances to step S25. At step S25, the data record section 106 records the essence data files supplied from the data generation section 103 to the optical disc 17 through the drive 66.

5           At step S25, the data generation section 103 generates a frame meta data data file (for example, the frame meta data data file 163) according to the parameter information supplied from the information obtainment section 102 and the video data and audio data supplied from the data obtainment section 101 and outputs the generated frame meta data data file to the data record section 106. Thereafter, the flow advances to step S26. At step S26, the data record section 106 records the frame meta data data file supplied from the data generation section 103 to the optical disc 17 through the drive 66.

10

15           At step S26, the data generation section 103 generates a clip meta data data file (for example, the clip meta data data file 162) according to the parameter information supplied from the information obtainment section 102 and the video data and audio data supplied from the data obtainment section 101 and outputs the generated clip meta data data file to the data record section 106. Thereafter, the flow advances to step S27. At step S27, the data record section 106 records the clip meta data data file supplied from the data generation section 103 to the optical disc 17

20

25

through the drive 66.

At step S27, the data generation section 103 generates a picture pointer file (for example, the picture pointer file 164) according to the parameter information supplied from the information obtainment section 102 and the video data and audio data supplied from the data obtainment section 101 and outputs the generated picture pointer file to the data record section 106. Thereafter, the flow advances to step S28.

At step S28, the data record section 106 records the picture pointer file supplied from the data generation section 103 to the optical disc 17 through the drive 66.

At step S28, the clip generation section 104 generates a clip information file (for example, the clip information file 151) according to the parameter information supplied from the information obtainment section 102. Specifically, the clip generation section 104 generates a clip information file that contains attribute information (for example, [umid:060A2B3401010 10501010D12130000000123456789ABCDEF0123456789ABCDEF], line 7, Fig. 13, and so forth) that is described according to each type of essence data generated by the clip generation section 104 and with which each type of essence data is managed and attribute information (for example, [type = "IMX50"], line 8, Fig. 13, and [type = "LPCM16" trackDst = "CH1"], line 11, and so forth) that is described according to the parameter information

supplied from the information obtainment section 102  
and that is necessary to reproduce the essence data and  
outputs the generated clip information file to the  
table record section 107. Thereafter, the flow  
5 advances to step S29. At step S29, the table record  
section 107 records the clip information file supplied  
from the clip generation section 104 to the optical  
disc 17 through the drive 66.

At step S29, the index file update section  
10 105 executes an update process for the index file to  
add a new clip element to the clip table of the index  
file. Next, with reference to a flow chart shown in  
Fig. 17, the update process for the index file will be  
described.

15 At step S41 shown in Fig. 17, the index file  
update section 105 generates a clip element that  
describes management information such as umid of a clip  
and a file name (for example, [clip id = "C0001"],  
[umid = "0123456789ABCDEF0123456789ABCDEF  
20 0123456789AA"], [file = "C0001C01.SMI"], [dur =  
"12001"], and so forth), line 2 to line 5, Fig. 9),  
with which a clip is managed, according to the clip  
information file generated by the clip generation  
section 104. Thereafter, the flow advances to step S42.  
25 At step S42, the index file update section 105  
describes attribute information (for example, [fps =  
"59.94i"], [ch = "4"], [aspectRatio = "4:3"], and so

forth) that is necessary to reproduce a clip to the  
clip element generated according to the parameter  
information supplied from the information obtainment  
section 102. Thereafter, the flow advances to step S43.  
5 Since [dur =] is generated according to the generated  
clip information file 151, for convenience of  
description, [dur =] is contained in management  
information with which a clip is managed. Instead,  
[dur =] may be contained in attribute information that  
10 is necessary to reproduce a clip.

At step S43, the index file update section  
105 generates a clip child element that describes  
management information such as umid of essence data  
contained in a clip and a file name (for example, [umid  
15 = "0123456789ABCDEF0123456789ABCDEF0123456789A1"] and  
[file = "C0001V01.MXF"], line 3 and line 4, Fig. 10)  
with which a clip is managed in a clip element  
according to the clip information file. Thereafter,  
the flow advances to step S44. At step S44, the index  
20 file update section 105 describes attribute information  
(for example, [type = "DV25\_411P"], line 4, Fig. 10)  
that is necessary to reproduce each type of essence  
data in the generated clip child element according to  
the parameter information supplied from the information  
obtainment section 102. Thereafter, the flow advances  
25 to step S45.

At step S45, the index file update section

105 adds (registers) the generated clip element  
(containing the clip child element) to the clip table  
of the index file stored in the RAM 53, updates the  
index file, and outputs the updated index file to the  
5 table record section 107. At this point, the index  
file update section 105 registers the generated clip  
element to the last clip element registered in the clip  
table. The table record section 107 records the index  
file supplied from the index file update section 105 to  
10 the optical disc 17 through the drive 66, returns to  
Fig. 16, and completes the clip generation process.

As described above, since attribute  
information necessary to reproduce essence data is  
described in the index file and the clip information  
15 file, when data are reproduced from the optical disc 17,  
attribute information necessary to reproduce essence  
data can be obtained according to the index file or the  
clip information file. Thus, since attribute  
information does not need to be read from essence data,  
20 the process time for the reproduction is shortened.

In addition, attribute information necessary  
to reproduce essence data is managed with both the  
index file and the clip information file. Thus, the  
process time for the reproduction is shortened with  
25 reference to the index file on the optical disc. In  
addition, other devices can use the clip information  
file, which is versatile.

Next, with reference to a flow chart shown in Fig. 18, a clip reproduction process of the photographing device 14 will be described. In Fig. 18, the case of which a clip is reproduced according to the 5 clip information file will be described.

The photographing staff member operates a button or the like of the operation section 61 to check photographed clips and causes the photographing device 14 to reproduce his or her desired clip. As a result, 10 the operation section 61 outputs a clip reproduction command signal to the CPU 51. When the CPU 51 has input the clip reproduction command signal through the operation section 61, the CPU 51 causes the reproduction control section 55 to start reproducing 15 the clip from the optical disc 17.

At step S101 shown in Fig. 18, the clip reproduction section 111 waits until the clip reproduction start command has been issued from the CPU 51. When the clip reproduction section 111 has 20 determined that the clip reproduction start command had been issued from the CPU 51, the flow advances to step S102. At step S102, the clip reproduction section 111 controls the clip information obtainment section 114 to read a designated clip information file (for example, 25 the clip information file 151) from the optical disc 17 through the drive 66. The clip information obtainment section 114 stores (loads) the clip information file to

the RAM 53. Thereafter, the flow advances to step S103.

At step S103, the clip reproduction section 111 controls the clip information obtainment section 114 to obtain umid (for example, [umid: 060A2B3401010  
5 10501010D12130000000123456789ABCDEF0123456789ABCDEF],  
line 7, Fig. 13) and attribute information (for example,  
[type = "IMX50", line 8, Fig. 13, [type = "LPCM16"  
trackDst = "CH1", line 11, and so forth] of essence  
data to be reproduced from the clip information file  
stored in the RAM 53. The clip reproduction section  
10 111 controls the index file information obtainment  
section 113 to obtain the file name (for example, [file  
= "C0001V01.MXF"]) corresponding to the obtained umid  
from the clip table of the index file stored in the RAM  
15 53. Thereafter, the flow advances to step S104.

At step S104, the clip reproduction section 111 controls the drive 66, the encoder/decoder section 56, and the output section 63 to reproduce essence data from the optical disc 17 according to the attribute  
20 information and the file name obtained by the clip information obtainment section 114 and completes the clip reproduction process. Specifically, the drive 66 reads essence data according to the file name under the control of the clip reproduction section 111 and supplies the essence data to the encoder/decoder section 56. The encoder/decoder section 56 decodes the essence data according to the attribute information  
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supplied from the clip reproduction section 111 and outputs the decoded data to the monitor and speaker that compose the output section 63.

As described above, since attribute information necessary to reproduce essence data can be obtained from a clip information file, it is not necessary to obtain necessary information for the reproduction from essence data. Thus, the process time is shortened.

Next, with reference to a flow chart shown in Fig. 19, a clip reproduction process that reproduces a clip according to the index file will be described. Since the process at step S121 shown in Fig. 19 is basically the same as the process at step S101 shown in Fig. 18, the description will be omitted.

At step S121 shown in Fig. 19, the clip reproduction section 111 waits until a clip reproduction start command has been issued from the CPU 51. When the clip reproduction section 111 has determined that the clip reproduction start command had been issued from the CPU 51, the flow advances to step S122. At step S122, the clip reproduction section 111 controls the index file information obtainment section 113 to obtain a clip element to be reproduced from the clip table of the index file (for example, the index file 134) stored in the RAM 53. The index file information obtainment section 113 obtains the file

name (for example, [file = "C0001V01.MXF"], line 4, Fig. 10) of essence data to be reproduced from the obtained clip element and attribute information (for example, [type = "DV25\_411P"], line 4, Fig. 10) necessary to reproduce the essence data. Thereafter, the flow 5 advances to step S123.

At step S123, the clip reproduction section 111 controls the drive 66, the encoder/decoder section 56, and the output section 63 to reproduce essence data 10 from the optical disc 17 according to the attribute information and the file name obtained from the index file information obtainment section 113 and completes the clip reproduction process. Specifically, the drive 66 reads essence data from the optical disc 17 15 according to the file name under the control of the clip reproduction section 111 and supplies the essence data to the encoder/decoder section 56. The encoder/decoder section 56 decodes the essence data according to the attribute information supplied from 20 the clip reproduction section 111 and outputs the decoded data to the monitor and speaker that compose the output section.

As described above, since attribute 25 information necessary to reproduce essence data can be obtained from the index file, it is not necessary to read essence data and clip information file from the optical disc 17 and to interpret them. Thus, the

process time can be more shortened than the reproduction process shown in Fig. 18.

When a clip is reproduced according to the index file, the read time for the clip information file is shortened. When all clips are continuously reproduced from the optical disc 17, it can be expected that the process time is more shortened in the following case.

Next, with reference to the accompanying drawings, a tape reproduction process of the photographing device 14 will be described.

The photographing staff member operates a button or the like of the operation section 61 to check all clips that he or she have photographed and to cause the photographing device 14 to performs the tape reproduction process. When the photographing device 14 uses a tape as a record medium and reproduces data therefrom, the data are successively reproduced in the order of which they were recorded. The tape reproduction process is a successive clip reproduction process that successively reproduces all clips from the optical disc 17 as if data were reproduced from the tape.

The operation section 61 outputs a tape reproduction command signal to the CPU 51. When the CPU 51 has input the tape reproduction command signal through the operation section 61, the CPU 51 causes the

reproduction control section 55 to start the tape reproduction for the optical disc 17.

At step S151 shown in Fig. 20, the tape reproduction section 112 waits until the tape reproduction command has been issued from the CPU 51. When the tape reproduction section 112 has determined that the tape reproduction start command had been issued from the CPU 51, the flow advances to step S152.

At step S152, the tape reproduction section 112 controls the index file information obtainment section 113 to obtain a first clip element from the clip table of the index file (for example, the index file 134) stored in the RAM 53. The tape reproduction section 112 obtains the file name (for example, [file = "C0001V01.MXF"], line 4, Fig. 10) of essence data to be reproduced and attribute information (for example, [type = "DV25\_411P"], line 4, Fig. 10) necessary to reproduce the essence data from the obtained clip element. Thereafter, the flow advances to step S153.

At step S153, the tape reproduction section 112 controls the drive 66, the encoder/decoder section 56, and the output section 63 to reproduce essence data from the optical disc 17 according to the obtained attribute information and file name. Specifically, the drive 66 reads essence data from the optical disc 17 according to the file name under the control of the tape reproduction section 112 and supplies the essence

data to the encoder/decoder section 56. The encoder/decoder section 56 decodes the essence data according to the attribute information supplied from the tape reproduction section 112 and outputs the 5 decoded data to the monitor and speaker that compose the output section 63.

When the tape reproduction section 112 has completed the clip reproduction process at step S153, the flow advances to step S154. At step S154, the tape 10 reproduction section 112 determines whether the reproduction process for all clip elements of the clip table of the index file have been completed according to information supplied from the index file information obtainment section 113. When the tape reproduction section 112 has determined that the clip table of the index file has a clip element that had not been 15 reproduced, the flow returns to step S152. At step S152, the tape reproduction section 112 controls the index file information obtainment section 113 to obtain 20 the next clip element from the clip table of the index file stored in the RAM 53 and repeats the process from the next step.

When the tape reproduction section 112 has determined that the reproduction process for all clip 25 elements of the clip table of the index file had been completed, the tape reproduction section 112 completes the tape reproduction process.

As described above, since a clip is reproduced with reference to the index file, it is not necessary to read essence data or the clip information file for attribute information necessary to reproduce the clip. Thus, the read time is shortened. When the reproduction is changed from one clip to the next clip, occurrence of a time lag can be suppressed.

In the tape reproduction shown in Fig. 20, the case of which clips are reproduced with reference to the index file was described. Of course, clips may be reproduced according to the clip information files. In this case, since umid needs to be converted in the index file, it takes a time. Thus, when data are reproduced from an optical disc, it is preferred that the index file be used.

As described above, attribute information necessary to reproduce essence data is managed with both the index file and the clip information file. On an optical disc, the index file is referenced with which the reproduction process can be more quickly performed than the clip information file to shorten the reproduction process time. When other devices are used, the clip information file that is versatile is used. The other devices may use the clip information file for processes that reproduce and edit essence data.

In the foregoing example, the case of which video data, audio data, low resolution data, frame meta

data, clip meta data, edit list, and so forth are recorded on an optical disc was described. As a record medium on which these types of data are recorded, besides the optical disc, an optical-magnetic disc, a magnetic disc such as a flexible disc or a hard disk, a magnetic tape, or a semiconductor memory such as a flash memory may be used.

In the foregoing example, the case of which the photographing device 14 records and reproduces a clip was described. However, the information process apparatus that records and reproduce a clip may be other than the photographing device 14. For example, the information process apparatus may be the planning terminal device 11, the field PC 15, or the editing terminal device 16 shown in Fig. 1. Instead, the information process apparatus may be other than these devices.

As described above, in the information process apparatus according to the present invention, reproduction information necessary to reproduce data is obtained when the data are recorded. A first management file with which the data are managed for each piece thereof is generated, the first management file describing the reproduction information and an identifier that uniquely identifies the data. Management information of the data composed of the reproduction information, the identifier of the data,

and information that represents the recorded position  
of the data are registered to a second management file  
with which the data recorded on the record medium are  
totally managed. As long as these processes are  
5 performed, they may be preformed in any methods. In  
addition, another process may be performed along with  
these processes. The structure of the information  
process apparatus according to the present invention  
may be other than the structure shown in Fig. 2 as long  
10 as these processes can be executed.

The foregoing sequence of processes may be  
executed by hardware. As described above, these  
processes may be executed by software. When the  
sequence of processes are executed by software, the  
15 software is installed from a record medium or the like  
to a computer that has hardware in which a program that  
composes the software has been installed or a general-  
purpose personal computer that can install various  
types of programs and execute corresponding functions.

20 As shown in Fig. 2, the record medium is  
unaccompanied by the photographing device 14. The  
record medium is delivered to the user to provide the  
program. The record medium on which the program has  
been recorded is provided as a magnetic disc (including  
25 a flexible disc), an optical disc (including CD-ROM  
(Compact Disc-Read Only Memory), DVD (Digital Versatile  
Disc), an optical-magnetic disc (including MD (Mini-

Disc) (registered trademark)), or the removable media  
71 including a package medium composed of a  
semiconductor memory or the like. Instead, a computer  
in which the ROM 52 and the hard disk, including the  
5 storage section 63, that store the program has been  
installed may be provided to the user.

In this specification, steps that describe a  
program provided by a medium are executed sequentially  
in the order of which they are described. Instead, the  
10 steps may be executed in parallel or discretely.

In this specification, the system represents  
a whole apparatus composed of a plurality of devices.

As described above, according to the present  
invention, data can be smoothly reproduced. In  
addition, according to the present invention, a  
15 plurality of pieces of data can be successively and  
smoothly reproduced.

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